Paths to urban sustainability, James Cook University, Townsville

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Dr Douglas Goudie, Adjunct Lecturer & Senior researcher, Centre of Tropical Urban and Regional Planning; School of Earth and Environmental Science James Cook University; Nth. Queensland, Australia.
Douglas.Goudie@jcu.edu.au

This paper provides a transition path from sustainability *intent* to sustainability *implementation*. The inseparable nature of land use and consequent urban travel to and through activity centres provides an example of implementation methodology, drawing on north Queensland urban travel research and one-day *Paths to sustainability* workshop at James Cook University in 2008.

The goal of a 90-person workshop was to help guide university decision-makers on making the campus and proposed $B1.3 expansion into a vibrant urban hub, a 'living laboratory' and a 'sustainability exemplar'. This paper uses the JCU aspiration as the means to present a 'new way' of planning. The urgency of issues like food-kilometres, global warming and peak oil, along with all planning law and policy demands that we proceed with sustainable urban travel options, from Transit Oriented Development to the development of safe, smooth, direct, continuous and broad paths to and through urban activity centres.

This paper details developing theoretical frames which informed and grew from the workshop, comparing that with current urban sustainability literature and ways to quantify alternative development scenarios to support the uptake of *Sustainability Implementation Planning - SIP* projects.

By combining locally advanced and integrated thinking on SIP with emergent quantifiable sustainability index measures and standing sustainability law and policy, this paper constructs the framework for a new form of science: Sustainability Implementation Science, applicable to SIP.

The complexity of multi dimension issues and stakeholders, current and future, in implementing urban sustainability means decision-makers need guidance in breaking with the 'old way' and implementing the far more challenging planning 'new way' of inclusive and cohesive planning. Designing for people access with minimised fossil fuel footprint to and through activity centres is a good lead example of how to achieve *SIP*.

Low fossil carbon and environmental problems, policies and laws
Burning fossil carbon is a core environmental problem confronting the planet. Its use is embedded in unsustainable environmental and socio-economic human behaviours. 'Fossil carbon' has problem subgroups: global warming, peak oil and food provision. We urbanites need to reduce our carbon footprint; to support walking, cycling, transit oriented development and landuse planning which integrates home location with usual household destinations.

This paper provides transport-related and landuse-related results from a 90-person *Paths to sustainability* workshop held at James Cook University, Townsville in August 2008. The workshop was introduced to, and helped develop, a conceptual frame on the 'path to sustainability' using a decision matrix based on agreed values, principles and process. This paper details the urban travel and landuse-related outcomes from that one-day workshop.

Section 1 provides a conceptual frame for SIP, the *Values principles and processes* (VP&P) model. A research-based value (Figure 1, Goudie 2001, 2002) is that landuse, home location choice and consequent usual travel are three aspects of one issue (Banister 1995). They are inseparable, linked and interrelated. Section 2 describes workshop results surrounding landuse and urban travel, including paths to and through urban activity centres.

Section 3 focuses on sustainability law and policy in Queensland. That discussion includes the central planning issue of sustainability: how do we translate the clear law, landuse/planning policy and *intent* (Goudie 2008a) into SIP. Section 4 links workshop outputs with current sustainability and transport literature. The conclusion is that a viable urban future combines quantifiable measures of our ecological impact with social indicators to give a measure of sustainability (Amekudzi *et al* 2009, Sneddon 2000, Turner and Robbins 2008).

'Scenario impact quantification' allows planners and political decision-makers, for the first time, to measurably compare different 'sustainable' scenarios; scenarios which include carbon footprint, cradle-to-grave analysis, embodied and operating energy and water, and indicators of social wellbeing. This paper provides a clear set of process details to help transform institutions and their decision-making groups to break through the fear of the unknown which holds most institutional subgroups from embracing 'the new', threatening, largely untried but increasingly quantifiable paths to SIP.

The focus of this paper remains firmly on landuse and more sustainable urban travel, while emphasising the broad and integrated social, economic, environmental and cultural issues to steer societal paths to urban sustainability.

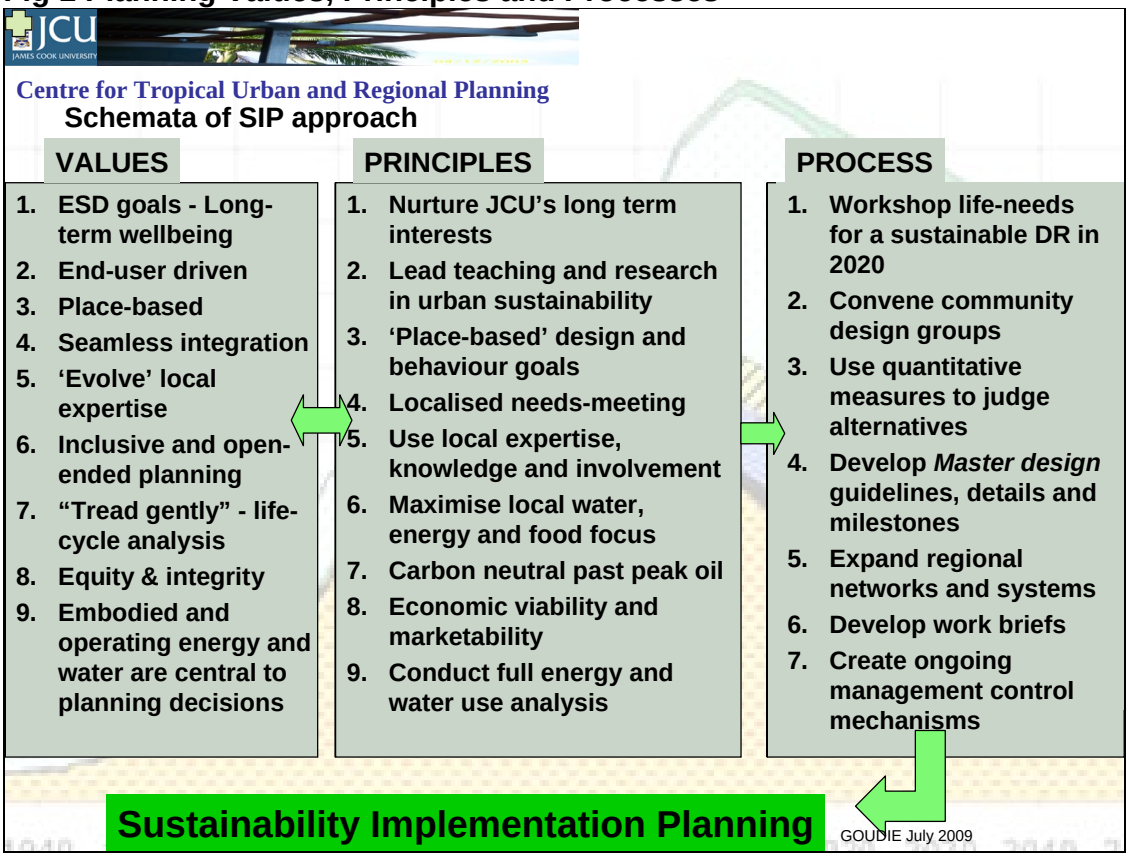
Step 2 in the *Paths to sustainability process* (Fig. 1) is being developed by JCU Townsville from July 2009, when a 'high level' focus group on residential issues agreed that aspects of sustainability – social, environmental, economic and

cultural, could be bundled together and badged as *urban sustainability*. SIP's premier value is that planning must be place-based and end-user driven. This means Discovery Rise (DR); the intended $1.3b makeover to a University Village in Townsville can credibly use the unifying label of *urban sustainability.* That requires nine interlocking elements (Figure 2*)* by combining: a community with economic drivers in education, research and development; so all planning, design and behaviour enhances profitable university-related enterprises. Using DR as a lead example, urban sustainability also includes ESD in the tropics. DR must be socially sustainable through community engagement, integrated planning, affordable living, equity of access and diversity. Finally, urban sustainability at DR must foster cultural identity and diversity of backgrounds and ages, protecting and enhancing cultural roots and growth through civic activity. Urban sustainability will be achieved through an emerging Science: Sustainability Implementation Science (SIS, Goudie 2009).

Section 1 Conceptual framework of SIP

This section provides a conceptual frame for SIP. Based on the belief that humans have a strong survival urge and a clear ability to plan ahead and form large cohesive groups (Stern *et al* 1995), the following values, principles and processes are a roadmap from ecologically sustainability *intent* to sustainable planning *action* (JCU 2007, Goudie 2008a+b).

Fig 1 Planning Values, Principles and Processes



A key problem in achieving an holistic approach to SIS is that the last 200 years have so successfully developed by reductionist specialisation (Sneddon 2000). From education to engineering, from politics to planning, the specialist drills into specific problems and becomes narrowly expert. Because of this 'silo' structure, solving multidisciplinary problems like achieving urban sustainability is daunting and without much precedent. The challenge now to work across society in time and space (Barnes 2004) is highlit by the difficulties in getting even one section of one organisation cohesively working with another section (Amekudzi *et al* 2009). This is the central challenge we face and must overcome.

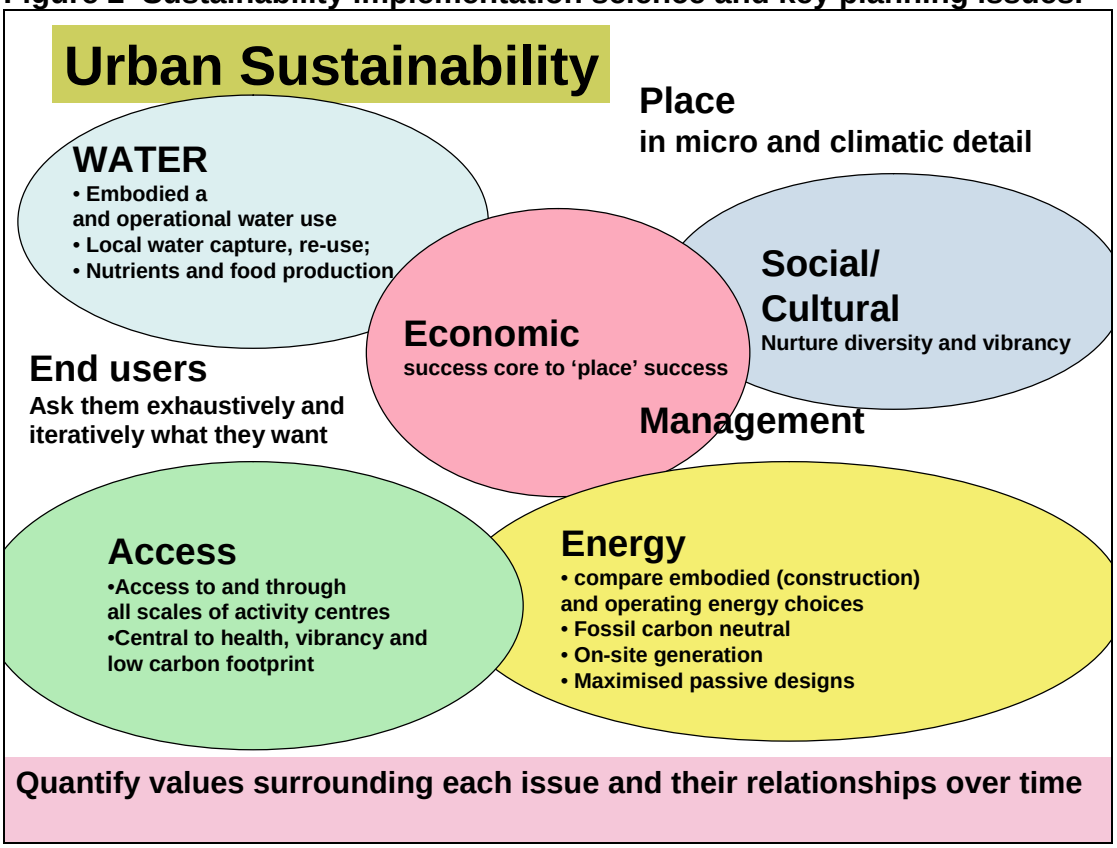
Sustainability implementation science

Sustainability implementation science can be conceptually viewed as a Venn diagram, where SIS is the outer boundary. Within the outer boundary of SIS sits bounded clusters of issues; broadly they are fossil carbon, environmental, social and cultural, planning, management, law and policy. There is an increasingly important addition to these clusters, being a reproducible and 'green' ways to quantify alternative planning scenario decisions in sustainability terms.

Embodied and operating energy and water use are clear and quantifiable central issues in SIP (Figure 2, Koo and Ariaratnam 2008). Decision-makers, planners

and their employers can now quantify and compare all the relevant (and external) project costs over time. End users are placed centrally in the SIP methodology for any planning decision. Quantification is the emerging lever to properly translate strong SIP *intent* into SIP *action*. In Figure 2, 'Place', Management and end-users are depicted as ubiquitous. All subsets should, ideally, overlay each other, and be open-ended to 'the outside world'.

Figure 2 Sustainability implementation science and key planning issues.



Section 2
Paths to sustainability workshop

James Cook University intends using 60 ha of land not directly needed for academic use to leverage a $1.3 billion makeover to become Discovery Rise, a sustainability exemplar. JCU's plan is to 'engage with industry and government.' 'JCU is a site and catalyst for innovation and understanding… to be a global leader in environmentally sustainable infrastructure development (and) operation in the Tropics" (JCU 2008).

The place-based and end-user driven 90-person workshop was conceived by JCU planners and the Centre for Excellence in Tropical Design (http://tropicaldesign.org/ **)** to progress the genuine aspiration for JCU to foster future viability of the Townsville campus. The process was chaired by the author. The goal was to map the elements and paths needed to get the best long-term use of existing land and regional knowledge resources. The methodology is detailed elsewhere (Goudie 2008b).

The workshop went through a series of *think and discuss* group exercises to develop aspirational goals, through to what is essential for this site and end-users to achieve sustainability. As it related to urban travel, connectivity between nodes and a focus on paths for pedestrians, cyclists, wheelchair and pram users was developed; a vision of what would provide a sustainable access mix to and through the campus. The group of 90 were also asked to define what future focus groups they wanted to be in. Forty-three attendees volunteered 103 focus group topics to help steer the broad, University-focused urban development into becoming a sustainability exemplar, a living laboratory (JCU 2007).

Broader inclusions

Necessarily the workshop helped develop and add to the VP&P methodology. Needing to integrate with surrounding activity centres forming a larger destination node, the working group invited decision-makers from the nearby army base (the largest in Australia); the regional hospital and major shopping complexes. They attended the workshop. The Townsville mayor attended the workshop and prior site inspection, along with many council and planning, developer and JCU student and staff representatives. The Vice Chancellor attended and, like the Mayor, responded to the group on the workshop summation. There was broad involvement and support from representative end-users and encompassing decision-makers.

Integrating land use and planning in urban travel to one conceptual frame of people living and moving about the urban landscape with minimum daily and weekly travel. This translates as higher density urban nodes where most needs are met within that node. In this way, along with calculations of embodied and operating water and energy use in the built environment, integrating with housing with usual destinations. This holistic settlement will have safe, continuous,

smooth, direct and broad paths to and through all scales of urban nodes, central to SIP.

Results

Workshop outcomes from 10 groups, focused on more paths, less cars, and housing near usual destinations or attractive transit stops.

Aspirations

"Community integration and social fabric, vibrancy, with enjoyable living. Bring the wider Townsville community to our campus, attracting people to our engineering or water solutions. Zero carbon footprint. Connect the university via an innovative transport system through all nodes. All town needs; reliable public transport – perhaps light rail. Attractive unique facilities. Connected, legible and accessible. People walking, cycling. Connected paths, fewer roads. Reticulated, recycled water. Community food gardens. Carbon neutral renewables. Energy monitoring. Direct/easy access. Healthy people movement; Facilitate amenity. Suburbs living together. Strong, collaborative linkages and networks."

Ideally

"ACCESS: Public transport – reliable. light rail. densification. Clean transport within the university. Integrated bicycle/ped traffic. Hard engineered spaces to provide visible shaded movement corridors that link nodes of mixed use. Bicycle pooling. shady. Medium density housing. Choice. High rise. WIDER LINKS: Accessibility to the university – transport on macro level. Connecting JCU with community via: an innovative transport system – fast, efficient, integrated connecting critical nodes in the city. Light rail linkages (city, beaches). Dialogue with hospital, defence and community. E.g. most desired services. Synergies."

Necessary

"Recognise DR as a central transport node, integrated with the city transport system. Have weather-protected paths. User-pay car parking to reduce demand. Pay to park and to transit.

Committed plan for local area code – include each precinct, with specific plans and codes to control developments – height, density, carbon foot-printing, open space, car parking, building specifics like minimum overall sustainability elements which can be allowed, specific transport links between DR and other Townsville centres. For the town centre, commitment to community service needs, and ensuring links to surroundings.

Design from first principles. Transport to be low energy, at the human scale, convenient and easy to use.

Community – conscious of safety and security in design. Passive and active. Provision of regionally significant infrastructure, activities and attractions. Bring users together to overlap. Blending academic, residential, commercial and

recreational purposes. Energy and resources – the development to have grid-fed renewable energy, with zero carbon footprint target."

We are going into a new place, a technological city or town; a village that is sustainable, and the planet hasn't done it before.

Workshop groups said: "Residential accommodation will be along corridors and nodes of medium and high density dwellings. Transit centres within the university (Transit Oriented Design) also appropriate for users coming to and leaving university (e.g. coming to an evening event). Car free environment: bike and pedestrian networks internal and external. Maximum public transport. electric vehicles on site. Public car park node. Minimisation of roads/car park footprint. Cycle access routes weather protected. Enough space for secured bike spaces at all residences and campus buildings. User pays parking. Abolish the use of fossil fuel transport within campus. Climate sensitive movement networks. Internal transport and pedestrian design – commitment from all. Transportation within the site will be low energy, human scale and convenient.

Encourage diverse mix of people in as many areas as possible. Provision of pathways to encourage pedestrian and cyclist migration between precincts. vegetated. Natural shaded and cooled water features to reduce air temperature. Design shall be on a human scale (not vehicle scale)."

Suggested inclusion in ongoing focus groups

Half the participants volunteered for self-defined ongoing focus groups. As they relate to landuse/access: "Bicycle use. Alternative transport design. Minimise carbon footprint. Sustainability and energy solutions. Renewable energy and energy efficiency. Carbon offsets. Water/nutrients. Food/nutrients. Food production. Composting, community gardens. Links to adjacent and further cluster partners."

Some reference to the water/nutrient/food production has been left in this report because it is a key decision-maker in broad sustainable urban landuse and can be quantified as part of the ecological and social indices (Gosh *et al* 2009, Harris 2009, Yakubov 2009)

Section 3 SIP law and policy

Through a lengthy consultation and inclusion process, the federal government introduced AMCORD (AMCORD 95) in 1995 – The Australian Model Code of Residential Development – the first federal effort at national urban planning guidelines which the states, territories and local governments were required to adapt and adopt. This led to laws and policies in all Australian jurisdictions, like the Integrated Planning Act (1997) in Queensland. The draft replacement in 2009 is the similarly intended Sustainable Planning Bill (QG 2009).

Like IPA, the **"**Purpose of Act [the SPB Draft, Part 2.3] is to seek to achieve ecological sustainability by**—** ensuring the process … delivers sustainable outcomes. [Part 5 .. and will..]: take account of short and long-term environmental effects of development at local, regional, State and wider levels, including, for example, the effects of development on climate change, and

(iii) apply the precautionary principle. and (iv) seek to provide for equity between present and future generations; and ensuring the sustainable use of renewable natural resources and the prudent use of non-renewable natural resources by, for example, considering alternatives to the use of non-renewable natural resources, and

(c) avoiding, if practicable, or otherwise lessening, adverse environmental effects of development, including, for example— (i) climate change and urban congestion; and (ii) adverse effects on human health; and (d) considering housing choice and diversity, and economic diversity; and (e) supplying infrastructure in a coordinated, efficient and orderly way, including encouraging urban development in areas where adequate infrastructure exists or can be provided efficiently; and

(f) applying standards of amenity, conservation, energy, health and safety in the built environment that are cost-effective and for the public benefit; and (g) providing opportunities for community involvement in decision making." (QG 2009).

Our politically preferred future is clear

There are local government policies reflecting the same *values and principles,* as the above-quoted state government urban planning law, requiring greater pedestrianisation, more paths and more 'efficient' landuse (TTSP 2000). The workshop participants overwhelmingly supported these ESD goals, and offered practical criteria to help usher them in.

Planners, residents and all entities have some inherent 'stake' in our collective future, but the pivotal challenge to get from the above planning *intent* to *implementation* will flow more from addressing the unmet demand displayed by workshop participants than from clinging to an old way of doing planning business. That 'old way' ignores embodied and operating energy and water calculations over the life of an intended project. The accounting is incomplete.

Section 4 Quantifying sustainability is the lever

Bruntland (1987) recorded the global sustainability intent and principles. Human geographers have a well developed debate on sustainable development, un-linking development issues and just speaking of sustainability (Sneddon 2002). Sneddon argues for *thematic socio-ecological transformation*, along with authors like Arvidsson (2009) delving into *ethics* and *current values*, Bassett (1999) writing on the *sociology of science* and Bdour *et al* (2009) considering

sustainable wastewater treatment and reuse. Bergen *et al* (2001) define *design principles for ecological engineering;* Campbell and Laherrere (1998) 'mainstreamed' the concept of peak oil and Capps (2009) outlined Green buildings. The City of Melbourne (2008) provides one of the few built examples where the VP&P approach has been comprehensively applied to '*Council House 2'* in Melbourne. Eakin and Wehbe (2009) considered *vulnerability* with system sustainability.

Geographers compare economics in sustainability with the 'old' linear industrial model (get, use, throw away), providing a more 'organic' *neoclassical circular flow model* (Sneddon 2002). The emergent literature and the input from the DR *Paths to sustainability* workshop converge on needing to measure the total set of issues included in Sustainability Implementation Science (SIS). Figure 2 provides an early indicator of the issues in the SIS equation:

Urban Sustainability Quotient = f(PxEuxWxExEcxAxScxM) ….. Equation 1, linked to Figure 2.

Thus an intended project can gain a sustainability quotient by defining it as a function of *Place (P)* in the micro, macro and climatic detail, as place relates to *End users (Eu)* and intended functions, by asking end-user representatives exhaustively and iteratively what they need and want. This is functionally related to needs-meeting for *Water (W),* both embodied and operational water use, considering local water capture, re-use, nutrients and food production. Needs-provision includes *Energy (E),* quantified by comparing embodied (construction) and operating energy choices, aiming for projects to be fossil carbon neutral, to have maximised on-site generation and maximised passive building/landscape designs.

Economic success (Ec) is core to 'place' success. *Access (A)* is strictly an energy issue, but from a needs-meeting perspective, people, goods, materials and information need to get access to and through all scales of activity centres. People access (car or alternatives-based) is important to health, vibrancy and a low carbon footprint. Also, successful and sustainable *people places* need to have *Social/Cultural (Sc)* diversity and vibrancy. Without that, 'place' will tend not to attract people.

Finally, and linked to all the other parameters, management/control of the process, from initial conception to ongoing function, innovation, conservativism and adaptation is necessary to sustainability success. As external and internal realities change, so inclusive management must anticipate and administer anything from benign dictatorship to fully end-user directed management, with key structures to ensure the agreed VP&P are the decision filters to a long-term dynamic balance with the remnants of nature.

Like Social Indicators, much of the science of human impact is well evolved, e.g. www.footprintnetwork.org. Social Indicator measures (ie Schwirian 1995,

Royuela et *al* 2009), quantify the quality of life. This quantification of *social indicators of well-being* is a mature field in social science. There are often 20 factors used to quantify *quality of life*.

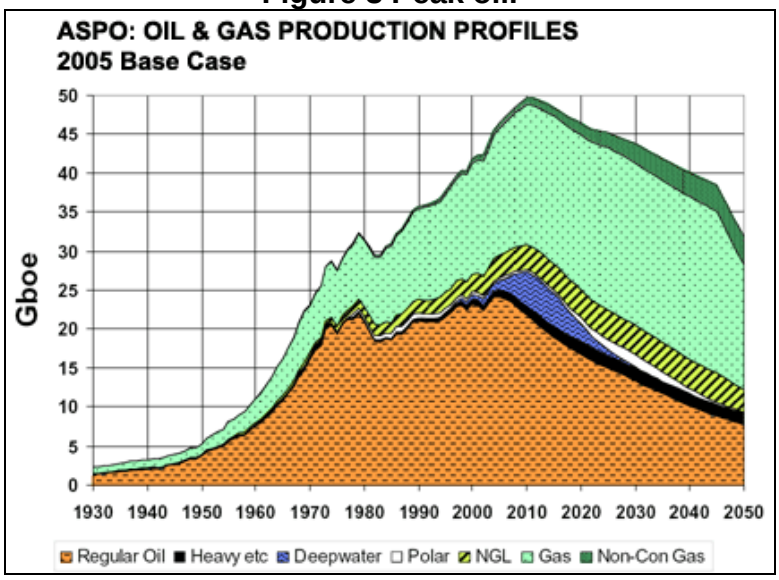
Royuela et *al* (2009) quantified commuting from different parts of Catalonia. They found local travel wellbeing was dependent on access to shopping, work and study, leisure activities and health care commute attributes. Royuela *et al* assert the research-backed value that "the main aim of spatial planning is to make direct improvements on the quality of life" (p 438, 2009).

Measuring and comparing environmental, energy, economic and social sustainability

Relevant to the core themes of this paper, Amekudzi *et al* (2009) develop a sustainability footprint framework and model. Aligned with developments leading the DR aspirations, Amekudzi considers the ecological and the social issues – the measurable quality of life issues (Schwirian 1995) in relation to environmental impacts: the beginnings of consensus on measuring sustainability (Figure 2 & Equation 1). Put simply, "countries or other entities that have experienced little or no change (or a decrease) in their quality of life with a simultaneous increase in the ecological footprint per capita can be considered to be moving away from sustainability." (Amekudzi *et al* 2009, p343).

Finally, no planning discussion is complete without placing peak oil – the elephant in the car-based landscape - prominently when imagining our urban spaces; our nodes or activity centres and their links 20 years from now (Figure 3).

Figure 3 Peak oil.



From: http://www.peakoil.net/

Section 5 SIP urban travel process detail

The workshop outcomes (Goudie 2008 b) are a rich mine to guide SIP and evolving urban access, landuse and home location choices. A focus on access to and through activity centres is one necessary prism through which to conceptualise and plan SIP, as part of a ***WEFACS*** set of SIP checklists of concurrent and interlocking sustainability planning issues, where ***WEFACS*** = Sustainable Water, Energy/environment/economics/engineering/education, Food, Access/amenity, Culture/cohesion/commercial and Social dynamics.

Given the focus of this paper on Sustainable urban access; knowing that housing choices as they relate to usual householder daily and weekly destinations and links with broader nodes, workshop participants and the current literature underline that sustainable urban access needs to:

1. Continue engaging institutional and bureaucratic decision-makers in the urgency of SIP.
2. Bracket all government and place-based approaches to planning; include urban transport planning groups with urban land use/land release groups, to integrate the land use/urban travel approach to planning: 'Landuse and consequent urban travel detail'.
3. Work with decision-making groups and end-users at the destination/Activity Centre level to articulate and help design safe, continuous, smooth, direct and broad paths to and through every Activity Centre.
4. Work with landowner administrators to ensure that end of trip facilities are available for all path users.
5. Ensure that any new or upgraded major road or centre includes cohesive path access and passage.
6. Within the values of SIP, ensure that there is an ongoing dialogue between existing and potential end-user cyclists, wheelchair and pram users and pedestrians to explore and map preferred access (desire lines) to and through activity centres.
7. Integrate sustainable urban travel, including attractive public transport with all other aspects of urban sustainability in ways described in this paper.

Conclusion

This paper shows how to embrace sustainability values, and articulate the flow-on SIP principles and processes. With the emergent capacity to create comparative impact and outcome data there will be empirical guidance that reductionist specialists can use to fully usher in urban sustainability. There is an emergent intellectual framework, combining all the attributes of reductionist science with shared human values. This synthesises carbon footprint calculations with water use and 'environmental and ecological footprints' and social indicators to form the new *Sustainability Implementation Science*. JCU is pioneering this *intent into practice* in Townsville, north Queensland Australia.

Sustainability laws and intent are ubiquitous, through impressive words and diagrams, but the passage from sustainability *intent* to sustainability *implementation* is fraught with institutional and bureaucratic barriers. The clearly stated and detailed needs of more sustainable urban travel from the *Paths to Sustainability* workshop are increasingly articulated in the literature. If top-level lawmakers, managers and decision-makers are prepared to lead their organisations' *policy into practice*, there is a need to envisage sustainable futures, and then quantify the long-term impacts of various choices.

Taking policy into practice, the rationale, will, legal requirements and emergent tools exist to embrace and implement sustainable urban planning without further delay. If issues at the relatively micro level (JCU Townsville) are fractals of the macro-level climate change, population increase, depleting petroleum reserves and an effective Emissions Trading Scheme, it is the VP&P approach being developed at JCU which may usher in this new way of planning, where the long-term is central to decision-making. Institutions, rather than protecting their old 'closed' power structures and relationships need to reach out in meaningful networks considering place, purpose and human needs-meeting.

Like increasingly marginalised 'climate sceptics' of recent decades, there are decision-making 'sustainability sceptics' who block initiatives as unnecessary, untried or unknown; and thus intimidating. Scenario quantification, taking the environmental footprint with social measures of well-being to produce a sustainability index. This provides the capacity to compare alternative planning choices over the life of the project, including prior 'externalities' like embodied and operational energy and water use. The workshop emphasised the need for clear and effective links between JCU and the broader community and for Discovery Rise to become a central transport node, with weather-protected paths and possibly high-rise housing, with high parking fees and safety as part of the push-pull strategies to have more paths and less cars into the future. Mixed and blended land use was advocated, along with social and cultural diversity.

Using guidelines provided by the workshop and current literature, quantifying urban sustainability choices, outlined in this paper, will become the lever to strongly and rapidly usher in SIP. The oversubscribed workshop and impressive level of offers for ongoing input shows a strong unmet demand and will for SIP in North Queensland. The current literature indicates the will and desire is widespread, as 'carbon footprint', 'peak oil' and 'climate change' enter our mainstream language and understanding. Changing our energy, water and food procurement and use to the local scale are major but achievable challenges for sustainability planners. Because of our growing understanding of peak oil, the SIS will and analysis tools can be applied to landuse/urban travel planning to change from car-based to path-based. This stands as a pressing and permanent change we need to make in reconfiguring the urban landscape to sustainable urban futures.

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